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DEVELOPMENT AND CHARACTERIZATION OF FILMS FROM POTATO STARCH MODIFIED BY DRY HEATING TREATMENT

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Pôster

Resumo

The widespread use of petroleum-based packaging has raised concerns regarding environmental impact and human health. This scenario has driven the search for sustainable alternatives based on natural and renewable polymers, such as starch. However, native starch exhibits poor mechanical performance and high hydrophilicity, which restricts its applications. These limitations can be addressed through starch modification. One promising approach is dry heat treatment (DHT), a simple and "green" technique that induces carbonyl groups formation and alters the size and molecular distribution of starch chains, resulting in a newly functionalized polymer matrix. In this study, the modification of potato starch by DHT was investigated using various processing durations with the aim of developing films with potential packaging applications. Potato starch was modified at 130 °C for 1 (DHT_1h), 2 (DHT_2h), and 4h (DHT_4h). Films were produced by casting from a formulation containing 4% starch (native or modified), glycerol as a plasticizer (25% w/w starch d.b), and water as a solvent. The solution was poured into Petri dishes (0.18 g/cm^2) and dried in an oven at 35 °C for 13 h. Afterwards, the films were conditioned for at least 48 h (75% RH and 25 °C) before characterization. The films were characterized by their mechanical properties (ASTM D882-18), relative crystallinity (XRD), water vapor diffusion (WVD) (ASTM E96/E96M-22a), moisture content, and light transmittance (UV-Vis spectroscopy). Film properties were influenced by DHT time, resulting from the complex balance between carbonyl group content and molecular size distribution. The DHT_1h and DHT_2h films exhibited increases in tensile strength (66 and 73%, respectively) and Young's modulus (up to 374% for DHT_2h) compared to the native film. In contrast, no significant improvements were observed in these parameters for DHT_4h, suggesting a hormetic effect. Elongation at break progressively decreased with DHT time, attributed to the greater compaction of the polymer matrix. Relative crystallinity increased with DHT time, indicating enhanced structural organization, accompanied by a reduction in moisture content and WVD (up to 41%). Light transmittance was also affected: more opaque films were obtained for DHT_1h and DHT_2h, whereas DHT_4h yielded more translucent films. Therefore, DHT-modified potato starch films have tunable structural and functional properties, demonstrating their potential as a promising alternative for the development of starch-based packaging.

Programação

10:30 até 11:30 em 18/11/2025
Salão Real
(https://eventos.galoa.com.br/slacan-2025/calendar/activity/21157)

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Eixo Temático

- Engenharia de Processos e Tecnologias Emergentes (ET)

Palavras-chave

DHT

Bio-based packaging

Modified starch